ATTACHMENT 15
INCINERATOR SYSTEMS

LIST OF TABLES

15.1 Background

This section contains detailed information on the United States Army Chemical Agent Munitions Disposal System (USACAMDS) incinerators in accordance with 40 CFR 270.19(c)(2), 270.62, and applicable sections of 264.340, 264.341, 264.342, 264.343, 264.344, and 264.345.

The USACAMDS incinerators include the Deactivation Furnace System, Metal Parts Furnace, and Liquid Incinerator.

USACAMDS incineration systems will be used for treatment and disposal of chemical agent munitions, agent contaminated wastes and other chemical agent demilitarization process wastes. The USACAMDS facility will still be used to test and develop procedures for operation of equipment and other future test operations.

15.2 Metal Parts Furnace and Pollution Abatement System

15.2.1 General Description

The purpose of the Metal Parts Furnace (MPF) is to incinerate: residual GB, mustard (H, HD, and HT), and VX agent contamination from munition components and other wastes as in Table 15.5, and thermally detoxify scrap metal.

The Metal Parts Furnace processing system includes a direct-fired, two-chamber, roller hearth furnace, a secondary combustion chamber, quench tower, a variable-throat venturi scrubber, a packed bed scrubber, a demister vessel, a prime mover with exhaust duct, bulk item loading system, and scrap handling and cooling equipment. The Metal Parts Furnace air pollution abatement system is designed to clean the flue gases of particulate and chemical pollutants.

The primary combustion chamber, the secondary combustion chamber, the charge car, and the feed conveyor are housed within a ventilated shroud. The shroud, as well as the remainder of the equipment, is housed within a prefabricated steel enclosure.

The following subsections describe the individual components that make up the MPF.

15.2.2 Primary Combustion Chamber

The roller hearth furnace is made up of three zones: an uninsulated entry/air lock, a refractor-lined heating chamber for controlled volatilization and incineration of agent (primary combustion chamber, Zone 1), and a secondary refractory-lined heating chamber for final burnout of agent (primary combustion chamber, Zone 2).

The heating chambers, zone 1 and zone 2, of the furnace are provided with natural gas burners arranged to give direct flame impingement on the side of the bulk containers (ton containers, projectiles, bombs, and spray tanks). Auxiliary fuel controlled burners are provided above and below the work level for heating tray loads of projectiles or other items.

15.2.3 Secondary Combustion Chamber, Zone 1 and Zone 2

Fumes from the entry air lock and primary combustion chamber pass through the secondary combustion chamber (or afterburner). The secondary combustion operates with a flue gas temperature of 1650 °F and provides a minimum residence time of 1.0 seconds.

15.2.4 Quench Tower and Venturi Scrubber

The quench tower is of a proprietary design that assures saturation of the flue gases before entering the venturi scrubber. This is accomplished by spraying water into the gas stream, evaporating the water, and simultaneously cooling the gases.

Flow is controlled to each spray nozzle manually and a flow indicator (rotameter) is provided for each spray nozzle. There is no minimum pressure setting for these atomizing spray nozzles. If a nozzle should get plugged, this would be indicated by a drop in flow to that particular nozzle. The water supply to that nozzle would be shut off and the nozzle removed and cleaned while the rest of the nozzles continue to operate. The nozzle would then be reinserted into the quench tower and restarted.

Effluent temperature is not controlled directly. The spray water flow is adjusted manually to balance effluent temperature and the liquid level in the packed tower sump. The quench tower is mounted on top of the venturi for concurrent operation. Process data for the quench towers are shown in Table 15.1.

The venturi scrubber is provided to remove particulate and gases from the quenched exhaust gas stream. Saturated flue gas from the quench tower flows into the top of the venturi scrubber. The venturi scrubber pressure drop is automatically controlled about a set point. The venturi scrubber is provided with a variable-area throat that is adjusted to maintain the specified pressure differential and high collection efficiency over a wide range of flue gas flow.

Throat velocities and the liquid-to-gas ratios vary, depending on the duty required to process different munitions. Nominal design values of gas flow and liquid-to-gas ratios are shown in Table 15.2. The range of pressure drop across the venturi is 15 to 45 inches water column.

The brine supplied to the venturi is drawn from the scrubber tower sump. This brine is filtered through a duplex basket strainer at the sump to remove solids greater than .25 inches. This strainer removes any solids that might cause blockage in the spray nozzles. If the spray nozzles to the venturi scrubber should become clogged, waste feeds to the incinerator would be stopped (though waste in the furnace would continue to be processed), the spray nozzles would be removed from the venturi, the solids removed and the spray nozzles reinstalled.

15.2.5 Packed Bed Scrubber Tower

The packed bed scrubber is provided to remove acidic gases, and operate with countercurrent liquid and gas flow. The gases from the venturi scrubber flow upward through the scrubber packing, and the liquid flows downward. The packing provides

contact area to ensure that the gases are thoroughly scrubbed. The liquid rundown is collected in a separate vessel for recirculation back to a distributor at the top of the scrubber. Packed bed specifications are listed in Table 15.3.

TABLE 15.1
MPF Quench Tower Specifications

ITEM	MPF/LIC
Spray Nozzles	
Number	4
Size	1/4"
Make	Spraying Systems Inc.
Model	1/4 AE-5-120-SS
Nozzles Locations	8-1/2" below inlet
Atomizing Media Pressure (psig)	0-80
Expected Droplet Size Range (microns)	50-100
Turndown Ratio	18:1
Nozzle Design Pressure (psig)	40
Water flow rate (gpm)	0.4-7.3
Quench tower dimensions	3' diameter 6'3" height
Materials of construction in Quench Tower Extension sprays	Inconel w/refractory (first 2 ft) 303SS
Ancillary Monitoring Equipment Control Equipment	Thermocouple

Table 15.2 Venturi Specifications	
Item	**MPF**
Spray Nozzles Number Size Make Model	 6 1-1/4" Bete MP531N
Nozzle Location	3 @ 21" below inlet 3 @ 27" below inlet
Atomizing Media Pressure (psig)	30
Expected Droplet Size (microns)	100
Design/Maximum Pressure Drop (in. Water Column)	38.8/45
Design Inlet Gas Flow (acfm)	6917
L/G Ratio (gpm/1000 acfm)	17.3
Minimum Brine pH	8
Maximum Design Total Dissolved Solids in Scrubber Liquid (%)	15
Throat Control	Manual or Automatic
Construction Materials	Hastelloy G
Ancillary Monitoring Indicators	Liquid Flow Temp
Control Devices	Manual or Automatic Flow Control of Liquid
Pumps No. Type Capacity Horsepower Mfg. Spec.	 1 Centrifugal 320 gpm 15 Goulds 3196MT 3x4-10 or other ANSI standard process

TABLE 15.3 Packed Bed Scrubber Specifications	
ITEM	**MPF/LIC**
Packing Media	2" polypropylene Intalox Saddles
Packing depth (feet)	7
Design pressure inlet gas flow (acfm)	16100
L/G ratio (gpm/1000 acfm)	19:1
Maximum design total dissolved solids in liquid (%)	15
Minimum pH of liquid	8.0
Maximum expected HCL loading (lb/hr)	156
Construction of Scrubber Materials	Carbon steel w/monel or Stellite Lining
Ancillary Equipment Location and Description Monitoring Control	 None. Manual or Automatic liquid flow control
Pumps Type Number Horsepower Capacity Mfg. Specs.	 Centrifugal 1 15 300 Goulds 3196MT or other ANSI Standard Pump

15.2.6 Demister Vessel

Immediately downstream from the packed bed scrubber are metal mesh demisters used to remove large liquid droplets from the gas stream. The demisters are made of stainless steel. The fiber bed mist eliminators contain polyester filters in fiberglass or stainless steel cages and are located in a separate vessel located outside the MPF building.

Pressure drop across the Metal Parts Furnace demister vessel is generally in the 5 to 30 inch water column range. The particle removal efficiency of the fiber-bed mist eliminators is unaffected by an increase in pressure drop, only the throughput of the system is affected.

The demister unit is in service for all furnace operation. Gases from the packed bed scrubber flow through the fiber filters from inside to outside. The filters in the Metal Parts Furnace demister may be washed if pressure drops start becoming excessive, or replaced if washing is ineffective.

When the pressure drop across the unit exceeds 30 inches on the filter bed mist eliminator, the eliminators are replaced.

15.2.7 Scrubber Liquor pH Control.

Acid gases react with caustic in the scrubber solution to form salts. Fresh water and caustic are continuously added to control pH to 9.5 ± 0.5. The specific gravity is determined once per hour. The maximum specific gravity for the brines is 1.15, but the brines will be replaced prior to reaching that level. Spent brine is periodically pumped to the retention tanks. To reduce the quantity of spent brine, a filter press, as an option, will be used to extend the useful life of the scrubber solution. The process continuously pulls

a stream of scrubber liquor and filters out the solids and undissolved salts during furnace operation. The filtrate is returned to the scrubber for reuse. The filtered solids will be managed the same as salts generated during the brine drying process.

15.2.8 PAS Brine Retention Tanks

Brine tanks are provided to permit isolation and sampling of the brine solution. The brine is checked for agent contamination. If contamination exists, the brine will be shipped to the Toxic Maintenance Facility (TMF) where decontamination solution will be added to the brine, and the brine will be sampled again. When no agent is detected, the brine will be transferred to the brine drying area using the brine transfer system.

The caustic tank provides an interface supply between the main caustic supply source and the scrubber system. The tank is 2000 gallons and is sized for approximately 8 hours holdup of 18 percent, by weight, sodium hydroxide at 125 percent of the normal flue gas flow rate. The tank is equipped with a level control and an automatic blocking valve on the inlet.

15.2.9 Scrap Handling and Cooling Equipment

A ventilated hooded station is provided at the furnace discharge end. Agent monitoring is performed at the discharge end to ensure that no agent is present. Testing has established acceptable operating parameters to ensure that material exiting the Metal Parts Furnace is decontaminated. If agent were detected after an item was moved into the hooded station it would be moved back into the furnace for further treatment.

15.2.10 MPF Cooling Bays

Two air-cooling chambers are located within the enclosure, and adjacent to the furnace discharge car traverse track, for cooling the scrap metal parts. The scrap metal parts are removed from the hooded station and transferred to one of the cooling chambers. The transfer car is remotely controlled for maximum operator safety. The cooling chambers are completely enclosed with a steel shroud to direct the cooling airflow. Each chamber has a remotely operated vertical rising door to minimize air entrainment.

15.2.11 Discharge Area

Scrap from bulk item processing is conveyed on trays using the discharge car to shuttle the trays to an off loading roller conveyor located in the receiving and unloading area. This area is serviced by a rail crane and hoist. Transfer of the bulk items from trays to a waiting empty truck is accomplished by manipulating the rail crane and hoist controls. The hoist is equipped with a lifting arrangement designed to adapt to the various bulk items and projectiles. The electric hoist has remote controls for manual operation of the equipment. The operator loads the scrap metal directly into waiting trucks.

15.2.12 MPF Design and Operating Conditions

This section provides a brief description of the operating conditions for the MPF components.

The Metal Parts Furnace employs a gradual heat up, to minimize thermal stresses to the system. Feed to the furnace consists of only one agent type during any scheduled operating period. The furnace remains in operation at all times during scheduled operating days, except when maintenance is required.

Loaded trays are transported to the furnace by the charge car. The car motion is remotely controlled from the control panel. Currently, bulk items enter the furnace loading area via the roller conveyor through the Multipurpose Demilitarization Facility.

The bulk items are placed on the tray located on the roller conveyor immediately adjacent to the Bulk Items Facility/Multipurpose Demilitarization Facility (BIF/MDF) conveyor airlock outer door. Upon placement of the bulk item onto the tray, the outer door is opened and the tray/bulk item is transferred via the conveyer system through the MDF and then onto the charge car. The roller conveyor outer door isolates the "clean" side of the conveyor from the "contaminated" MDF and furnace loading area. Non-agent bulk items may be transferred via the return conveyor air lock to the change car.

Each furnace chamber is equipped with power-driven, tray-conveying rollers. The drives for each chamber can be operated independently. The furnace is provided with tightly fitting, automatically actuated doors. Positioning of the work trays is achieved by means of photocell switches that stop the work trays in the exact position required for a particular process operation.

The method of operation of the Primary and Secondary Combustion chambers depends on the item to be incinerated. Process parameters are adjusted to control the vaporization rate from containers filled with various percentages of agent heels. The Metal Parts Furnace also has the capacity to burn spent decontamination solution.

Flue products from the secondary combustion chamber are cooled by air-atomized water sprays in the quench tower. From the quench tower, the gases flow into a high-energy venturi scrubber followed by a packed bed scrubber tower and a demister vessel. Motive power for the gas flow circuit is provided by an induced draft fan. Gases are vented through the stack equipped for continuous monitoring.

A sodium hydroxide solution is used as the scrubbing liquid in the venturi and the packed tower. The spent caustic brine is pumped to a holding tank and is analyzed for agent contamination.

Detoxified scrap metal parts are removed from the furnace and transferred by the discharge car to the cooling chambers. After the scrap is cooled and certified, it is loaded into trucks using a remotely operated crane and hoist. The trays are returned for reloading.

15.2.13 Fuel/Feed Systems

Natural gas is pumped directly to the ten burners located in the primary combustion chamber of the MPF. Fuel consumption in the primary combustion chamber during normal operation is 717 to 5800 scfh natural gas. The secondary combustion chamber consumes 1435 to 4480 scfh natural gas during normal operation.

15.2.14 Capacity of Induced Draft Fan

The induced draft fan pulls the gases through the pollution abatement system. A variable speed fan controls the flow to maintain a negative pressure in the furnace systems. The clean gas is discharged to the atmosphere through the exhaust stack.

The 300-horsepower exhaust blower pulls effluent from the primary combustion chamber through the secondary combustion chamber, the quench tower, venturi scrubber, packed bed scrubber, and demister vessels to a 24-inch-diameter by $62^{1}/_{2}$ foot exhaust duct to atmosphere. The blower is rated to deliver 15,400 acfm at 154 °F against a system resistance of 68-inch water column.

15.2.15 Automatic Waste-Feed Cutoff System

The Metal Parts Furnace is designed to thermally treat drained munitions with residual agent, liquid wastes, and trash filled burn baskets. The munitions consist of the following; projectiles, bombs, spray tanks, and ton containers. The munitions are fed into the Metal Parts Furnace using trays and a roller conveyor. The agents are vaporized and the metal parts are decontaminated by heating from burners fired by natural gas. Control of the combustion process is maintained through varying the firing rate of the burners. To enter the furnace chambers, the material to be burned must pass through a vertical sliding door. This door is controlled by the operator from a control panel within the MDM observation room. The operator opens the door to begin the feed to the furnace and closes the door once the material has entered. The automatic feed systems close and lock the door and stop the charging conveyor. The furnace feed doors form the waste feed cutoff device. This device is interlocked via the Programmable Logic Controller (PLC) control system. Unless the PLC system is operating with all interlocks satisfied the operator cannot open the door and feed waste materials to the furnace. The MPF waste feed cutoff parameters are listed in table 15.6.

15.2.16 Waste Liquid Feed System.

Spent decontamination fluid will be processed in the Metal Parts Furnace primary combustion chamber. These liquids are batch fed to the MPF. All manual waste feed operations will stop under the conditions listed in Table 15.6; MPF waste feed cutoff set points.

15.2.17 Process Monitoring and Control System(s)

The MPF stack gas is monitored continuously for the agent being processed by the ACAMS and the DAAMS. Oxygen and carbon monoxide concentrations in the stack gas are monitored by the CEMS. These and other MPF process parameters are monitored by instruments as described in table 15.7. All Metal Parts Furnace Data are recorded on the data acquisition system.

15.3 Specific Information for the Metal Parts Furnace [40 CFR 270.19 (c)(2)]

15.3.1 Manufacturer's Name, Model and Type

Primary Combustion Chamber

- Manufacturer's name - Surface Combustion, Division of Midland Ross
- Model # - None - Custom Design Unit
- Type - Roller Hearth, 2-Chamber Type

Secondary Combustion Chamber, Zone 1:

- Manufacturer's Name - Surface Combustion, Division of Midland Ross
- Model # - None - Custom Design Unit
- Type - Horizontal Refractory Lined

Secondary Combustion Chamber, Zone 2:

- Manufacturer's Name - Surface Combustion, Division of Midland Ross
- Model # - None - Custom Design Unit
- Type - Horizontal Refractory Lined

15.3.2 Incinerator Dimensions Metal Parts Furnace:

Primary Combustion Chamber, Zone 1:

- Width- 4 ft, height- 5.75 ft, length- 12 ft
  See Drawing 05-356-03 sheets 1,2

Primary Combustion Chamber, Zone 2:

- Width- 4 ft, height- 5.75 ft, length- 12 ft
  See Drawing 05-356-04 sheets 1,2

Secondary Combustion Chamber, Zone 1:

- Diameter- 4 ft 6 in, length- 24 ft
  See Drawing 05-357-01 sheet 1

Secondary Combustion Chamber, Zone 2:

- Diameter- 4 ft, length- 24 ft
  See Drawing 05-357-01 sheet 1.

15.3.3 Nozzle and Burner Design

Descriptions of present burners used in the Metal Parts Furnace primary combustion chamber and secondary combustion chamber are found on (Drawing TCDS-05-121-01 in Attachment 11).

Primary Combustion Chamber, Zone 1	
Burner Location	**Model/Feed Flow**
B05, B06, B07, B08	North American Burner Model 4422-4 580 scfh
B09, B10	North American Burner Model 4422-4 580 scfh

Primary Combustion Chamber, Zone 2	
Burner Location	**Model/Feed Flow**
B13, B14, B15, B16	North American Burner Model 4422-4 580scfh

Secondary Combustion Chamber, Zone 1	
Burner Location	**Model/Feed Flow**
B01, B02	North American Burner Model 4441-6 1120 scfh

Secondary Combustion Chamber, Zone 2	
Burner Location	**Model/Feed Flow**
B03, B04	North American Burner Model 4441-6 1120 scfh

15.4 Sampling and Analysis Techniques Used to Calculate Performance Standards

The stack gas is monitored continuously for the agent being processed by the Automatic Continuous Air Monitoring System. Whichever agent is being tested in the Metal Parts Furnace will be monitored to determine whether detectable amounts of the agent are present in the stack. A description of the agent monitoring systems is presented in Attachment 8; alarm levels for the different agents are listed in Table 15.4.

15.5 Liquid Incinerator

15.5.1. General Description

The primary purpose of the Liquid Incinerator (LIC) is to thermally destroy chemical agents GA, GB, mustard (H, HD, and HT), and VX through high temperature incineration. A secondary purpose for the Liquid Incinerator is to incinerate potentially agent contaminated liquid hazardous wastes such as spent decontamination solutions generated at USACAMDS.

The Liquid Incinerator consists of an agent supply and feed system, a primary combustion chamber, a crossover duct, and a secondary combustion chamber. The Liquid Incinerator currently uses natural gas for auxiliary fuel (and start-up/shut down), with agent being the primary fuel. The Liquid Incinerator and the Liquid Incinerator agent supply tanks are each housed in ventilated rooms that have been added to the southeast corner of the Metal Parts Furnace building. The Liquid Incinerator uses the Metal Parts Furnace Pollution Abatement System (i.e., the quench tower, venturi scrubber, packed bed scrubber, demister vessel, induced draft fan, and exhaust stack). The Liquid Incinerator and the Metal Parts Furnace will not treat wastes simultaneously.

However, one of these incinerators can be operating while the other is idling at low fire conditions.

Drawings contained in Attachment 11 of this permit show the configuration and process and instrumentation diagrams for the LIC and the MPF/LIC common PAS.

15.5.2. Liquid Incinerator Detailed Description

The following subsections describe the individual components of the LIC.

15.5.2.1. Primary Chamber

The primary incinerator chamber is fabricated of mild steel with multiple layers of refractory lining. The chamber exterior dimensions are approximately 5 feet in diameter by 11 feet 8 inches high. Pressurized agent is injected into the chamber near its bottom and perpendicular to the chamber's long axis. Agent is introduced directly into the burner. A Trane LV-5 Vortex burner rated at 1.7 to 5 million Btu/hr, serves as the heat source and as the agent injector. This burner is fueled by natural gas, which ensures immediate ignition of the agent.

Combustion air introduced through the burner assures the availability of excess air in the primary chamber for combustion of the agent. Temperature in the primary chamber during agent feed is between 2,300°F and 3,100°F. The minimum chamber temperature for feeding agent is 2,300°F. Residence time in the primary chamber is approximately 0.5 second. Effluent gases exit through a sidewall opening near the top of the chamber.

Agent is controlled on a flow set by the operator with a temperature trim, which throttles the flow if necessary. Basic operation of the system is as follows: The primary chamber is brought up to operational temperature using natural gas as a fuel. Once the chamber temperature is above 2,300°F, agent is introduced to the furnace through the agent burner nozzle. As the temperature of the chamber increases over the set point, the natural gas flow is decreased to the point where the burner is operating on agent as a fuel source. A small amount of natural gas is still flowing into the burner nozzle to stabilize the flame.

15.5.2.2. Crossover Duct

A refractory-lined steel crossover duct passes the hot effluent gases from the top of the primary chamber to the top of the secondary chamber.

Exterior dimensions of the duct are approximately 23 inches outside diameter by 7-1/2 feet in length (between flanges). Total interior length of the duct is approximately 9 feet. The crossover duct enters the top of the secondary chamber and is perpendicular to the chamber's vertical axis.

15.5.2.3. Secondary Chamber

The secondary chamber fabricated of mild steel with multi-layered refractory lining, serves as an afterburner. A Trane LV-3 burner, rated at 1 to 3 million Btu/hr, is mounted off-center at right angles to, and slightly below, the crossover duct entry. This burner maintains the secondary chamber's operating temperature at approximately 2,000°F. The

acceptable operating range of the secondary chamber is 1,800°F to 2,600°F. No less than 20 percent excess air is introduced to the chamber to ensure complete combustion of waste gases remaining in the effluent stream.

Either water or spent decontamination solution can be injected into the hot effluent stream through an injector located in the top center of the chamber. The water, or spent decontamination solution spray reduces the gas temperature of the primary chamber gases as they enter the secondary chamber. The feed rate for spent decontamination solution or cooling water varies between 0.5 to 3 gpm. Cooling water and spent decontamination liquid are not used simultaneously.

The effluent gas stream exits the secondary chamber through the sidewall near the chamber bottom. The residence time of the effluent gas stream in the secondary chamber is 0.5 second.

15.5.2.4. Slag Removal.

Spent decontamination solution introduced through the injector at the top of the chamber is dehydrated, producing a salt residue. The salt becomes molten and travels to the chamber bottom. The slag collection system consists of a drum collection unit and a material handling system. To remove slag, incineration operations will cease, and the system will be allowed to cool down before removing the drum. The drum will be allowed to cool, and the slag will be removed and placed in an approved hazardous waste container. The slag will be disposed of as hazardous waste.

15.5.3. Design and Operating Conditions

This section provides a brief description of the operating conditions for the LIC components.

Operators start Liquid Incinerator operations by igniting the main burner in the secondary chamber. Heat up of the chamber is limited to approximately 100°F per hour to avoid thermal shocking of the refractory lining. After the secondary chamber reaches 1,000°F, the LV burner in the primary chamber is started. Heat up of the primary chamber is also limited to approximately 100°F per hour. Before agent can be injected, the furnace is maintained at operational temperatures for 4 hours. This allows the refractory to reach operational temperatures and provide a heat sink for destroying agent should both burners shut down. When this soak time is complete and the temperature of the primary chamber is at 2,300°F, and the secondary chamber is at 1,800°F, agent feed to the primary chamber is started. Agent feed rate is manually increased until the demonstrated feed rate for a particular waste stream is achieved. Incineration of spent decontamination solutions can be started when the primary chamber is operating in the 2,300°F to 3,100°F range and the secondary chamber is operating in the 1,800°F to 2,600°F range. The spent decontamination solution may replace the water spray as a coolant to control temperature in the secondary chamber.

When the agent burn is completed, the primary chamber is maintained above 1,600°F for at least 6 hours. The secondary chamber is also kept at operational temperature during this period.

After the 6-hour period of operation, on auxiliary fuel (natural gas) only, the temperature of the two chambers is gradually reduced at approximately 100°F per hour. When both chambers drop below 1,000°F, the supply of combustion air to the chambers is terminated and the burners are turned off. Water spray coolant to the secondary chamber is also stopped when the temperature in the chamber drops below 1,000°F.

15.5.4 Pollution Abatement System.

The liquid incinerator uses the same PAS as the MPF previously described in this attachment. The effluent stream is cooled by air-atomized water in the quench tower. From the quench tower, the gases flow into a high-energy venturi scrubber followed by a packed tower and demister vessel. Motive power for the gas flow circuit is provided by an induced draft exhaust fan. Gases are vented through a stack equipped for continuous emissions and agent monitoring.

A liquor, pH-adjusted with sodium hydroxide, is used as the scrubbing liquid in the venturi and the packed tower. The spent caustic brine is pumped to a holding tank and then to the Brine Drying Area for drying or sent to an off-site TSDF for disposal.

15.5.5. Capacity of Induced Draft Fan

The 300 horsepower blower is controlled by a variable speed drive motor. The blower is rated to deliver 15,400 acfm at 154°F against a system resistance of 68-inch water column. The exhaust blower pulls the gaseous effluent from the incinerator's two chambers through the quench tower, venturi scrubber, packed bed scrubber, and demister vessel to a 24-inch diameter by 62-foot-6-inch high exhaust duct to the atmosphere.

15.5.6. Fuel/Feed Systems

The Liquid Incinerator primary burner uses agent as a primary fuel and natural gas as a secondary fuel. Natural gas consumption during normal operation is approximately 5,000 scfh of natural gas by the Trane LV-5 Vortex burner in the primary chamber and 3,000 scfh of natural gas in the Trane LV-3 burner in the secondary chamber. Natural gas igniters are used by both the primary and secondary chamber burners.

15.5.7. Feed Items and Rates

The design heat release rate of the LV-5 burner, with combustion air supplied to the burner at 18 inches water column pressure and 5 percent excess air, is 5 million Btu/hr. The maximum heat release occurs with agent VX at a maximum feed rate of 200 lb/hr and a heat of combustion of 15,000 Btu/lb for a total of 3.0 million Btu/hr.

Only one chemical agent, or waste containing one chemical agent, shall be fed to the primary combustion chamber of the Liquid Incinerator, at any given time.

15.5.8. Liquid Incinerator Automatic Waste-Feed Cutoff System

The Liquid Incinerator is designed to continuously burn agents drained from the munitions or bulk containers. Waste feed to the LIC is provided from the agent room tanks to the LIC primary chamber through a solenoid controlled, pneumatically powered

blocking valve identified as AV-10-L. This valve is located in the final segment of line going between the tanks and the LIC primary chamber.

This blocking valve controls the flow from the agent tanks to the Primary Chamber. The valve is interlocked through the PLC control program with the process monitoring instruments and the MPF PAS interlocks.

Flow of agent from the supply tank is automatically stopped in the event of any of the following conditions:

- Loss of flame in either the primary or secondary chamber
- Upset conditions in the pollution abatement system
- Loss of draft (negative pressure in primary chamber)
- Interruption of water, spent decontamination solution or other waste water to secondary chamber
- All waste feed operations are interlocked to automatically stop under the conditions listed in Table 15.8; LIC waste feed cutoff set points.

Process instrumentation for waste-feed cutoff is monitored on a graphic display in the control module so that individual operations can be checked at any time for correct function without disturbing the system.

The site incinerators are normally operated 5 days per week, from Sunday to Thursday. System checkout for proper operation of waste feed cutoffs is performed each time the incinerators are started and any problems with the automatic waste-feed cutoff systems are corrected at this time. The problem(s) would have to be corrected before system startup could be completed. The weekly startup and shutdown provides a reliable means for monitoring the automatic waste-feed cutoff instrumentation.

The Liquid Incinerator uses the Metal Parts Furnace's Pollution Abatement System and induced draft fan. The Liquid Incinerator's primary and secondary chamber burners are not on the USACAMDS emergency power system, but the Metals Parts Furnaces Pollution Abatement System and induced draft fan are on emergency power. When normal electrical power is lost, the Liquid Incinerator's automatic waste-feed cutoff system is activated. The Metal Parts Furnace Pollution Abatement System and induced draft fan are brought back on line with emergency power. The induced draft fan is operated at a reduced speed. Because the induced draft fan is operated at a reduced speed during emergency power operations, gases in the secondary chamber of the Liquid Incinerator have a longer residence time in the secondary chamber. A list of critical equipment that is supplied power from the backup generators during normal power outages is in the emergency procedures in Attachment 8.

15.5.9. Process Monitoring and Control System(s)

Stack gas is monitored continuously during LIC operation by ACAMS and DAAMS for the agent being processed in the LIC. Oxygen and carbon monoxide concentration in the

stack gas are monitored by CEMS. These and other LIC process parameters are monitored by instruments as described in Table 15.9.

15.5.10. Specific Information for the Liquid Incinerator (40 CFR 270.19 (c) (2)

15.5.10.1 Manufacturer's name, model, and type

Manufacturer's name - Trane Thermal
Model - Custom Design
Type - vertical multi layer refractory lined

15.5.10.2 Incinerator Volumes

Primary chamber -68.33 ft^3 inside volume
Crossover duct - 6.52 ft^3 inside volume
Secondary chamber - 64.73 ft^3 inside volume

15.5.10.3 Nozzle and Burner Design

Descriptions of burners in the Liquid Incinerator primary and secondary chambers are:

Primary Chamber:

Trane LV-5 Vortex burner (natural gas pilot ignited)
Btu/hr - 1.7 to 5 million
Fuel consumption- 5,000 scfh maximum
Combustion air - 47,200 scfh maximum
Atomizing air - 1,800 scfh
Nozzle - air atomized

Secondary chamber:

Main Burner:
Trane LV-3 (natural gas pilot ignited):
Btu/hr - 1 to 3 million
Fuel consumption- 3,000 scfh maximum
Combustion air - 28,320 scfh maximum
Atomizing air - 1,500 scfh
Nozzle - air atomized

The Trane Thermal LV Vortex burners are capable of using liquid fuels with a viscosity up to 200 centipoise. These are the same type of burners used at JACADS and TOCDF. The chemical agents at 25°C are:

GA	2.4 centipoise
GB	1.4 centipoise
HD	5.0 centipoise
VX	10.0 centipoise

The range of viscosities of liquid agents is well within the design range of viscosities for the LV burner. The turndown ratio for the LV burner was designed to be 4:1.

15.5.11. Methods of Monitoring Temperature, Waste-Feed Rates, Carbon Monoxide, and an Appropriate Indicator of Combustion Gas Velocity

The temperature in the Liquid Incinerator is continuously monitored and recorded. The temperature recorder has a range of 0 to 3,200°F. The temperature is controlled to a range of 2,300°F to 3,100°F in the primary chamber and 1,800°F to 2,600°F in the secondary chamber. If the temperature is outside of this range, the agent feed is automatically shut off. The agent feed rate is monitored by a mass flow meter having a range of 0 to 700 lb/hr. The combustion gas velocity from the primary and secondary chamber is indicated by a draft measurement in the primary chamber.

15.5.12. Sampling and Analysis Techniques used to Calculate Performance Standards with CFR Parts 264.343 and 264.345

The purpose of the USACAMDS facility is to establish operating parameters to ensure compliance with 40 CFR parts 264.343 and 264.345. Continued monitoring of agent will be performed while the Liquid Incinerator is in operation.

The stack gas is monitored continuously for the agent being processed by the Automatic Continuous Air Monitoring System. Whichever agent is being tested in the Liquid Incinerator will be monitored to determine whether detectable amounts of the agent are present in the stack. A description of the agent monitoring systems is presented in Attachment 8; alarm levels for the different agents are listed in Table 15.4.

During operation, the combustion gas velocity, and waste feed rate are monitored and recorded. Care is taken to ensure that all levels are maintained within specified limits.

TABLE 15.4
AGENT EXPOSURE LIMITS AND AGENT STACK LIMITS

LOCATION	GB	H/HD/HT	VX
Maximum Allowable Stack Concentration[1,2]	0.0003	0.03	0.0003
General Population Limit[1,3] (Averaging Time 72 hours)	0.000003	0.0001	0.000003
Work-place Time Weighted Average[1,3] (Averaging Time 8 Hours)	0.0001	0.003	0.00001

1 Public Law 91-121/144 (USC 1512) mandates that the United States Department of Health and Human Services (HHS) review the plans for transporting and/or disposing of lethal chemical agents and make recommendations for protecting human health and safety. HHS delegated review and recommendation authority to the Centers for Disease Control (CDC).

2 The Department of Army proposed the maximum allowable stack concentrations indicated in Table 1. HHS reviewed the concentrations and announced in the March 15, 1988 Federal Register (53 FR 8504) [corrected in 53 FR 11002, April 4, 1988] that the concentrations "met HHS criteria and appear to be more restrictive than limits set on a health base alone", and therefore made no recommendation for changes.

3 The March 15, 1988 Federal Register (53 FR 8504) [corrected in 53 FR 11002, April 4, 1988] announced that CDC concluded that the concentrations indicated in Table 1 will adequately protect human health; "even long-term exposure to these concentrations would not create any adverse health effects."

NOTE: CDC determined that the current available data precluded acceptable exposure limits for mustard agent being precisely defined. CDC concluded that the work-place limits will amply protect a general population 1000 meters or more from the demilitarization site for transportation route. Therefore, protection of the general public is dependent upon meeting the work-place limits within the facility.

Table 15.5 **Examples of Miscellaneous Agent Contaminated Waste That May Be Treated in The MPF**		
Waste Stream and Quantity (if applicable) [1]		**Waste Code**(s)
<u>Non-Combustible Solids: Process Equipment/Assorted Parts/Material (Metallic)</u> Structural Steel Steel Process Skids Ventilation Ductwork Fume Hoods Agent Process & Storage Tanks (metal) Conveyors Chains, Rollers, Links Gears, Bearings, Bushings Wheels, Idlers Gearboxes Carbon Adsorber Trays (from which carbon has been removed) Collets Drain Probes Crimp Jaws and Pins Bore Station Blades Turntable Projectile Bushings Projectile Pickup Heads Shear Blades Punches Pusher Assemblies Jaw Gripper Assemblies Projectile Cans Hoists		P999, F999
<u>Non-Combustible Solids: Process Equipment/Assorted Parts/Material (Non Metallic)</u> Gasket Materials (non-combustible) Seals (non-combustible)		P999, F999

Table 15.5
Examples of Miscellaneous Agent Contaminated Waste That May Be Treated in The MPF

Waste Stream and Quantity (if applicable) [1]		Waste Code(s)
Non-Combustible Solids: Plumbing Materials (Metallic) Pumps Piping/Fittings/Tubing (metal) Hydraulic Motors Hydraulic Cylinders Hydraulic Tubing/Fittings (metal) Pressure Regulators Flow Control Valves Spray Nozzles Pipe Gaskets (metallic) Valves (Hand, Solenoid, Agent, Decon, Hydraulic)		P999, F999
Combustible or Non-Combustible Solids: Plumbing Materials (Non Metallic) The Permittee shall determine the percentages of combustible and non-combustible content for Non-metallic Plumbing Materials Pumps Pneumatic Actuators Accumulator Bladders Chemical Seals Filter Cartridges/Elements and associated residue/cleanup material (includes AQS/ACS filter elements) Hydraulic Hose/Fittings		P999, F999
Combustible or Non-Combustible Solids: Instrumentation The Permittee shall determine the percentages of combustible and non-combustible content for Instrumentation Test Equipment (Meters, Gauges, Etc.) Sensors, Transmitters and Transducers Flow, Pressure and Proximity Switches Pressure Gauges Cameras or Camera Parts Load Cells Speakers Low Volume Agent Samplers Thermocouples and Thermo wells		P999, F999

Table 15.5
Examples of Miscellaneous Agent Contaminated Waste That May Be Treated in The MPF

Waste Stream and Quantity (if applicable) [1]		Waste Code(s)
Combustible or Non-Combustible Solids: Assorted Solids The Permittee shall determine the percentages of combustible and non-combustible content for Assorted Solids. Hand Tools Grating Metal Buckets, Pans, and Barrels Metal Brackets, Stands, Fixtures, Etc. Banding Material Empty Overpacks/Drums (Non-Combustible) Escape Air Tank, Mask, and Regulators Scrub Brushes Monitoring Sample Probes (DAAMS Tubes, etc.) Silicone material/parts (not to exceed the ash feed weight per tray) Glassware Plaster Paint Brushes, Rollers, and Pans Empty Paint and Lubricant Spray Cans (Punched), maximum 25 units per furnace charge Personal Protective Equipment DPE Leather Over Garments, maximum 10 units per furnace charge Empty plastic bags used to contain contaminated wastes Waste Surrogate Test Materials Paper, Cloth, Pads, Pillows, Spill Adsorbents		P999, F999
Non-Combustible Solids: Electrical Components (Metallic) The Permittee shall determine the percentages of combustible and non-combustible content for Electrical Components. Motors Conduit (Metal) Solenoids Switches (Safety, Limit, Light, etc.) Light Fixtures, maximum of 20 units per furnace charge		P999, F999
Liquid Waste Fuel Oil Hydraulic Fluid Lubricating Oil		P999, F999
Liquid Waste Waste Surrogate Test Materials		P999, F999, and codes specific to the surrogate materials

Notes:
1. Metal thickness shall not exceed four inches.

TABLE 15.6
Metal Parts Furnace
Waste Feed Cutoff Set Points
Incineration Operating Parameters

TAG NO.	PARAMETER	INSTRUMENT	SET POINT
TI-205	PCC Temperature High (1)	Thermocouple	1,750 °F
TI-205†	PCC Temperature Low (1)	Thermocouple	950 °F†
TI-202	SCC (2) Temperature High	Thermocouple	2,175 °F
TI-202	SCC Temperature Low	Thermocouple	1,450 °F
AI-19B-Ma	High Carbon Monoxide Concentration	CO Analyzer	(A)
FI-005-M	Combustion Gas Velocity	Velocity Transducer	10,000 SCFM*
AI-19A-M	High Oxygen Concentration	0_2 Analyzer	18 Percent O_2
AI-19A-M	Low Oxygen Concentration	0_2 Analyzer	3 Percent O_2
PDI-503	Low Draft Pressure, PCC	Differential Pressure Transmitter	0 inch w.c. (vac)‡
PDI-001	Venturi Pressure Drop	Differential Pressure Transmitter	20 inches w.c.
FT-001	Venturi Brine Flow Rate	Flow Orifice	30 gal/min
FT-002	Packed-Bed Tower Brine Flow Rate	Flow Orifice	150 gal/min
AI-3	Clear Liquor Feed	pH Meter	7.0
AI-4	Scrubber Brine	pH Meter	7.0
CEM-759-AG	Agent Monitor Alarm	ACAMS	(B)
TI-21	Venturi Temperature	Thermocouple	190 °F

Notes:
† The PCC Zone 1 Temperature is allowed to drop below 950 °F within the first five minutes after the furnace is charged.
* Measured Combustion Gas Velocity is converted to volumetric flow rate.
‡ PCC shall be maintained under a vacuum whenever the furnace exit door is closed.

(1) PCC=Primary Combustion Chamber
(2) SCC=Secondary Combustion Chamber
(A) 100 ppm CO: @7% 02 on dry volume basis for a 60 minute rolling average
(B) VX - 0.00006 mg/m3, H/HD/HT - 0.006 mg/m3
GA - 0.00006 mg/m3, GB - 0.00006 mg/m3

TABLE 15.7
Metal Parts Furnace
Process Monitoring Instrumentation

Tag No.	Control Parameter	Instrument	Location	Expected Operating Range	Range & Accuracy
TI-205	Primary Combustion Chamber Temperature [b,c,d]	Type R Thermocouple	Primary Combustion Chamber	950 to 1,750 °F	32 to 2,642 °F (± 0.25% full scale)
TI-202	Secondary Combustion Chamber Temperature [b,c,d]	Type R Thermocouple	Secondary Combustion Chamber	1,450 to 2,175 °F	32 to 2,642 °F (± 0.25% full scale)
AI-19B-M AI-19B-Mc AI-19B-Ma	Carbon Monoxide Concentration [b,c,d,2]	Rosemont Analyzer Model 8NGA-2000	Exhaust Stack	1 to 500 ppm[1]	0 to 3,000 ppm(± 1% full scale)
FI-005-M	Combustion Gas Velocity[b,c,d,f]	2-wire air velocity transducer Kurz 454	Exhaust Stack	(≤ 10,000 SCFM)	0 to 6,000 SFPM (± 1% full scale)
AI-19A-M	Oxygen Concentration [b,c,d,2]	Rosemont Analyzer Model 8NGA-2000	Exhaust Stack	3 to 18%	0 to 25%(± 1% full scale)
PDI-503	Primary Combustion Chamber Draft [b,c,d]	Differential Pressure Cell/ Transmitter	Primary Combustion Chamber, Zone 1	-0.25 to -6 inches w.c.	0 to -30 inches w.c. (±1% full scale)
PDI-001	Venturi Scrubber Pressure Drop [b,c,d]	Differential Pressure Cell/Transmitter	Venturi Scrubber	15 to 45 inches w.c.	0 to 100 Inches w.c. (±1% full scale)
FT-001	Venturi Brine Flow Rate [b,c,d]	Flow Orifice Transmitter	Brine Supply Piping	30 to 80 gal/min	0 to 80 gal/min
FT-002	Liquid Feed to Scrubber Tower [b,c,d]	Flow Orifice Transmitter	Brine Supply Piping	150 to 325 gal/min	0 to 350 gal/min
AI-3	Scrubber Liquid pH	pH Meter	Clear Liquor Loop	7.0 or above	0-14 pH
AI-4	Scrubber Liquid pH[e]	pH Meter	Scrubber Sump	7.0 or above	0-14 pH
TI-71	Venturi Temperature	Thermocouple	Venturi	32 to 2,200 °F (±3% full scale)	0 to 1400 °F (±3% full scale)
CEM-759-AG	Agent Alarm	ACAMS	Stack	n/a	0-10 ASC values (±10% full scale)

[1] CO concentration corrected to 7% 0_2 not to exceed 100 ppm, dry volume, over a one hour rolling average
[2] Attachment 19: Site Plan No. 49-03: "Laboratory support Division Monitoring Branch, Quality Control Plan"; Attachment 3: Site Plan No. 49-01: "Laboratory Support Division Analytical Branch, Quality Control Plan"; and Site Plan No. 49-07: "Laboratory Support Division Monitoring Branch, Quality Control Plan for Gaseous Continuous Emission Monitoring System (CEMS): Site Plan No. 33-04E"
[b] Continuous Monitoring.
[c] Continuous Recording.
[d] Maintenance, at a minimum, in accordance with equipment manufacturer's recommendations
[e] Sampled and recorded at a minimum of once every 60 minutes during operation.
[f] Measured stack gas velocities of 0-6,000 SFPM are automatically converted to volumetric flow rates ranging from 0-18,850 SCFM.

TABLE 15.8
Liquid Incinerator
Waste Feed Cutoff Set points
Incineration Operating Parameters

TAG NO.	PARAMETER	INSTRUMENT	SET POINT
TIC-24	PCC Temperature, High (1)	Thermocouple	3,100 °F
TIC-24	PCC Temperature, Low (1)	Thermocouple	2,300 °F
TIC-49	SCC (2) Temperature, High (off-gas)	Thermocouple	2,600 °F
TIC-49	SCC Temperature, Low	Thermocouple	1,800 °F
AI-19B-Ma	Stack Carbon Monoxide Concentration, High	CO Analyzer	(A)
FI-005-M	Combustion Gas Velocity, High	Velocity Transducer	10,000 SCFM*
AI-19A-M	Stack Oxygen Concentration, High	O_2 Analyzer	15 Percent O_2
AI-19A-M	Stack Oxygen Concentration, Low	O_2 Analyzer	3 percent O_2
PIC-20	Low Draft Pressure, PCC	Differential Pressure Transmitter	0 inch w.c. (vac)
PDI-001	Venturi Pressure Drop, Low	Differential Pressure Transmitter	20 inches w.c.
FT-001	Venturi Brine Flow Rate, Low	Flow Orifice	30 gal/min
FT-002	Packed-Bed Tower Brine Flow Rate, Low	Flow Orifice	150 gal/min
AI-3	Clear Liquor pH, Low	pH Meter	7.0
AI-4	Scrubber Sump pH, Low	pH Meter	7.0
TI-21	Venturi Temperature, High	Thermocouple	190 °F
FT-18	Waste Liquid Feed Rate, High	Mass Flow Meter	600 lbs/hr
FT-43	SDS Feed Rate, High	Mass Flow Meter	3 gpm
PSL-16-L	Waste Feed Atomizing Air Pressure, Minimum	Pressure Switch	80 psig
PSL-41-L	SCC Liquid Feed Atomizing Air Pressure, Minimum	Pressure Switch	15 psig
CEM-759-AG	Agent Monitor Alarm	ACAMS	(B)

(1) PCC=Primary Combustion Chamber
(2) SCC=Secondary Combustion Chamber
(3) ACAMS Monitors/DAAMS tubes
(A) 100 ppm CO:@ 7%O_2 on dry volume basis for a 60 minute rolling average
(B) VX-0.00006 mg/m3 H/HD/HT - 0.0006 mg/m3
GA-0.00006 mg/m3 L-0.03 mg/m3 GB-0.00006 mg/m3

* Note: Measured Combustion Gas Velocity is converted to volumetric flow rate.

TABLE 15.9
Liquid Incinerator Process Monitoring Instrumentation

Tag No.	Control Parameter	Instrument	Location	Expected Operating Range	Range &Accuracy
TIC-24	Primary Combustion Chamber Temperature [b,c,d]	Type R Thermocouple	Primary Combustion Chamber	1,600 to 3100 °F	32 to 3,200 °F (±0.3% full scale)
TIC-49	Secondary Combustion Chamber Temperature [b,c,d]	Type R Thermocouple	Secondary Combustion Chamber	1,700 to 2600 °F	32 to 3,200 °F (±0.3% full scale)
AI-19B-M	Carbon Monoxide Concentration [b,c,d,2]	Rosemont NGA 2000 Non-Dispersive Infrared Analyzer (dual range)	Exhaust Stack	1 to 500 ppm [1]	0 to 3000 ppm (±1% full scale)
FI-005-M	Combustion Gas Velocity [b,c,d,f]	2-wire air velocity transducer Kurz 454	Exhaust Stack	(≤ 10,000 SCFM)	0 to 6,000 SFPM (±1% full scale)
AI-19A-M	Oxygen Concentration [b,c,d,2]	Rosemont NGA 2000 Paramagnetic Analyzer	Exhaust Stack	3 to 15%	0 to 25% (±1% full scale)
PIC-20	Primary Combustion Chamber Draft [b,c,d]	Differential Pressure Cell/Transmitter	Primary Combustion Chamber, Zone 1	-0.25 to -6 inches w.c.	0 to -30 inches w.c. (±1% full scale)
PDI-001	Venturi Scrubber Pressure Drop [b,c,d]	Differential Pressure Cell/Transmitter	Venturi Scrubber	15 to 45 inches w.c.	0 to 100 inches w.c. (±1% full scale)
FT-001	Venturi Brine Flow Rate [b,c,d]	Flow Orifice Transmitter	Brine Supply Piping	30 to 80 gal/min	0 to 80 gal/min
FT-002	Liquid Feed to Scrubber Tower [b,c,d]	Flow Orifice Transmitter	Brine Supply Piping	150 TO 325 gal/min	0 to 350 gal/min
AI-3	Scrubber Liquid pH [b,c,d]	pH Meter	Clear Liquor Loop	7.0 or above	0-14 pH
AI-4	Scrubber Liquid pH [b,c,d]	pH Meter	Scrubber Sump	7.0 or above	0-14 pH
TI-21	Venturi Temperature	Thermocouple	Venturi	50 to 250 ^{o}F	0 to 1400 ^{o}F (±3% full scale)
FT-18	Waste Liquid Feed Rate	Mass Flow Meter		0-600 Lbs/hr	
FT-43	SDS Feed Rate	Mass Flow Meter		0-3 gpm	
PSL-16-L	Waste Feed Atomizing Air Pressure	Pressure switch	PCC	>80 psig	10 to 200 psig (±0.5 psig)
PSL-41-L	SSC Liquid Injection Nozzel Atomizing Air Pressure	Pressure switch	SCC	>15 psig	10 to 200 psig (±0.5 psig)
CEM-759-AG	Agent Alarm	ACAMS	Stack	n/a	0-10 ASC values (±10% full scale)

[1] CO concentration corrected to 7% 0_2 not to exceed 100 ppm,. dry volume, over a one hour rolling average
[2] Attachment19: Site Plan No. 49-03: "Laboratory Support Division Monitoring Branch, Quality Control Plan";
Attachment 3: Site Plan No. 49-01: "Laboratory Support Division Analytical Branch, Quality Control Plan"; and
Attachment 17: Site Plan No. 33-04E: "Continuous Emission Monitoring System (CEMS) Plan for Operations at USACAMDS"
[b] Continuous Monitoring.
[c] Continuous Recording.
[d] Maintenance, at a minimum, in accordance with equipment manufacturer's recommendations
[e] Sampled and recorded at a minimum of once every 60 minutes during operation.
[f] Measured stack gas velocities of 0-6,000 SFPM are automatically converted to volumetric flow rates ranging from 0-18,850 SCFM.